

ASTR120 Homework #8 – (Hamilton)
due Thursday Nov. 7 (20 Points)

Finish reading Chapters 11 and 12! This is the last graded homework before Exam 2 on Nov. 12. **These problems are from Chapter 11.**

56. The Mariner 2 spacecraft detected more microwave radiation when its instruments looked at the center of Venus's disk than when it looked at the edge, or limb, of the planet. (This effect is called limb darkening.) Explain how these observations show that the microwaves are emitted by the planet's surface rather than its atmosphere.

59. A hypothetical planet has an atmosphere that is opaque to visible light but transparent to infrared radiation. How would this affect the planet's surface temperature? Contrast and compare this hypothetical planet's atmosphere with the greenhouse effect in Venus's atmosphere.

63. The Mars Global Surveyor (MGS) spacecraft is in a nearly circular orbit around Mars with an orbital period of 117 minutes. (a) Using the data in Table 11-3, find the radius of the orbit. (b) What is the average altitude of MGS above the Martian surface? (c) The orbit of MGS passes over the north and south poles of Mars. Explain how this makes it possible for the spacecraft to observe the entire surface of the planet.

68. The classic 1950 science-fiction movie rocketship X-M shows astronauts on the Martian surface with oxygen masks for breathing but wearing ordinary clothing. Would this be a sensible choice of apparel for a walk on Mars? Why or why not?

74. You are to put a spacecraft into a synchronous circular orbit around the Martian equator, so that its orbital period is equal to the planet's rotation period. Such a spacecraft would always be over the same part of the Martian surface. (a) Find the radius of the orbit and the altitude of the spacecraft above the Martian surface. (b) Suppose Mars had a third moon that was in a synchronous orbit. Would tidal forces make this moon tend to move toward Mars, away from Mars, or neither? Explain.

These next problems are from Chapter 12.

40. Roughly speaking, Jupiter's composition (by mass) is three-quarters hydrogen and one-quarter helium. The mass of a single hydrogen atom is given in Appendix 7; the mass of a single helium atom is about 4 times greater. Use these numbers to calculate how many hydrogen atoms and how many helium atoms there are in Jupiter.

41. Use the information given in Section 12-3 to estimate the wind velocities in the Great Red Spot, which rotates with a period of about 6 days.

47. From the information given in Section 12-6, calculate the average density of Jupiter's rocky core. How does this compare with the average density of the Earth? With the average density of the Earth's solid inner core? (See Table 9-1 and Table 9-3 for data about the Earth.)